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Determining Storm Surge Return Periods: The Use of Evidence of Historic Events

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Storm surges are a major concern for many coastal communities, and rising levels of surges is a key concern in relation to climate change. The sea level of a statistical 100-year or 1000-year storm surge event and similar statistical measures are used for spatial planning and emergency preparedness. These statistics are very sensitive to the assessments of past events, and to future sea level change. The probability of a major storm surge from the Baltic Sea hitting the Copenhagen metropolitan area is determined by the Danish Coastal Authority based on tide gauge records. We have a long history for tide gauge measurements, with 120 years of data available for the calculations. However, the oldest of these tide gauge stations was set up after a major storm surge in 1872, and no events of similar severity have occurred since. In this study, we find that including the evidence of the historic event in 1872 dramatically changes the statistics, and discuss whether it is worth to include even older – and more uncertain – evidence of historic events. Further, we assess the very large impact of sea level rise on the storm surge statistics. As an example, according to the official statistics of southern Copenhagen, the flooding of a present day 100 year event will occur at least every 5 years with just 25 cm of sea level rise.

Keywords: storm surge, climate, regional, historic